Integration & Calibration Beam Test Subcommittee

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March 30, 2000

Beam Tests

- Photons
- Electrons *
- Hadrons – action list

*have not yet discussed

- Engineering Model
- Calibration Unit
- LAT Flight Unit *

Beam parameters

- Energy Range (20 MeV – 300 GeV)
- Single photon Energy
- Multiple photons contamination
- Knowledge of Energy ~ 10%
- Knowledge of beam angle
- Intensity
- Flux
- Beam dispersion
- Number of triggers – action list
- Number of reconstructed photons – action list
- Time stamp of events

In orbit we want to measure flux

$$\# \gamma = Aeff \times Flux$$

we must know very well Quality cuts and Background rejection cuts

Beam Test we must know very well the flux and the number of photons

$$\# \gamma = Aeff \times Flux$$

Multiple photons
Beam dispersion
Energy resolution

we must evaluate Quality cuts and Background rejection cuts

Measure 20 MeV – 15 GeV @ SLAC
then extrapolate results up to 300 GeV

BEAM TYPE (photons)	PRO	CON
"usual" GLAST with radiators of different thickness (incoherent brehmstrahlung)	•We have past experience	•Need to believe correction method for multiple photons •Need fine tuning to get down to 20 MeV •Need better photon tagger
Coherent brehmsstrahlung	•Monochromatic •Less run time needed •Smaller number of low energy photons	• De not know how to tag yet • Need fine tuning to get down to 20 MeV • Maybe available only in 2003
Van der Graaf	• Monoenergetic line •Can get down to very low energies	• Do not know how to tag yet
Backscattered laser (EGRET)	•EGRET experience •E dispersion = 20% at 20 MeV, 10% up to 3 GeV	•Low intensity •Intensity fluctuations (used a NaI to monitor) •Multiple photons •No tagger

Measurements at 300 GeV ?

- CAL resolution and/or ACD backsplash, no need for too many silicon trays
- We are now evaluating needs from both subsystems
- Maybe use the EM (2002) at CERN @ 200 GeV (requires some special tuning)
- Logistics may complicate enterprise since integration of DAQ and software is a non negligible amount of work

Energy vs Angle EGRET (photons)

Energy	Θ (inclination)	Φ (azimuth)
15 MeV	0 deg	0
20 MeV	10 deg	22.5 deg
35 MeV	20 deg	45 deg
60 MeV	30 deg	
100 MeV	40 deg	
200 MeV		
500 MeV		
1 GeV		
3 GeV		
10 GeV		

- 27 to 170 K triggered photons/bin
- 2 months of Beam Test
- < 150 runs

Energy vs Angle (photons)

A = effective area
PA = peak effective area
PSF = point spread function
E = energy resolution
FOV = Field of View

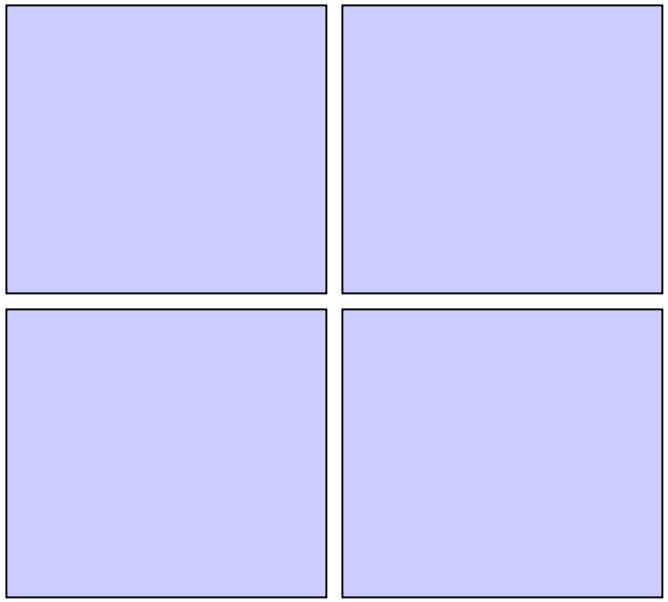
We need a 5th angle for the FOV

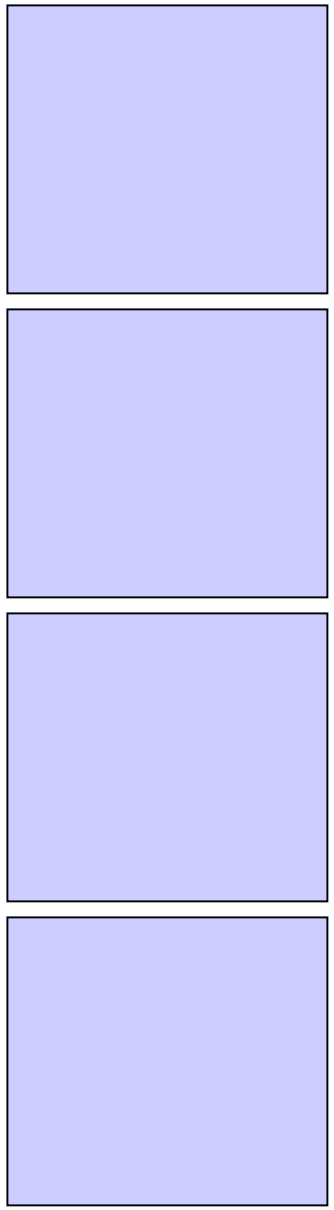
	0 deg	30 deg	55 deg	80 Deg
20 MeV	A,PSF,E		PSF	
100 MeV	A,PSF,E		PSF	
1 GeV	PA,PSF,E, FOV	FOV	FOV,PSF	FOV
10 GeV	PA,PSF,E		PSF	
300 GeV	A,PSF,E		PSF	

2 towers (Qual), May 2003 (M.N.)
4 towers, August 2003,
pushing for the CAL

Which configuration for the Calibration Unit ?

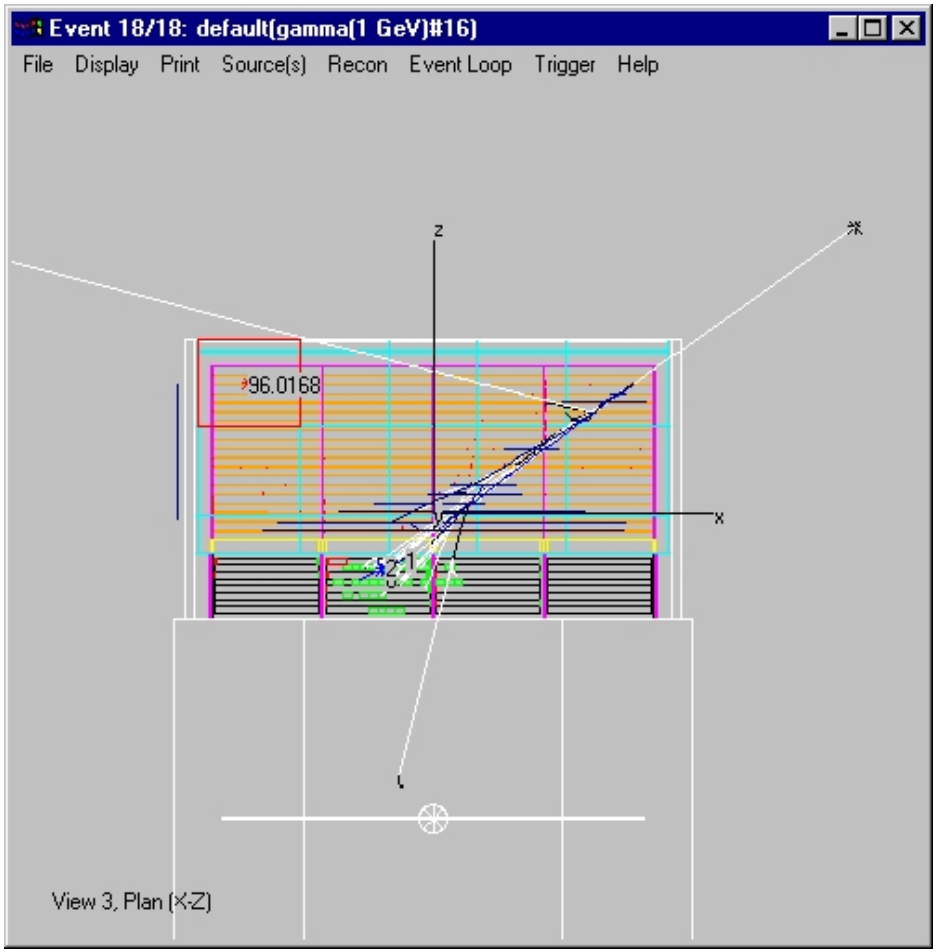
Tower alignment is now determined by mounting tolerances which are the order of 100 μm





•Adequate for PSF and calorimetry

•Hard to study azimuth dependence
•Not so good to understand tower walls



1 GeV at 55 deg
(photons)

Summary

- We are mostly focusing on the photon and hadron beams
- We have started to cover half of the science requirements (suggested changes and added more parameters)
- We are also evaluating input from simulation and current status from its validation

- Under evaluation
  - 1 x 4 Unit in a coherent photon beam at SLAC (20 MeV – 15 GeV)
  - Extrapolate results up to 300 GeV
  - EM at CERN 2002 @ 200 GeV to study energy resolution (CAL) and backsplash (ACD), possibly instrumented with few Si trays